FOURTH GRADE
Unit 6
Decimals
20 days
enVision 2.0 Topic 12

Overarching Understandings:
The set of real numbers infinite. Like whole numbers, fractions are real numbers and have an infinite number of equivalent forms. A decimal is another name for a fraction. The fundamental principles of numbers (comparison, ordering, and equivalence) and operations of whole numbers (addition, subtraction, multiplication, division) also apply to fractions/decimals. A fraction/decimal describes the division of a whole (region, set, length) into equal parts. Every whole number or fraction/decimal can be associated with a unique point on a number line. The base-ten numeration system is the way in which numbers are recorded using digits 0-9, groups of ten, and place value. The position or place of a digit in a number determines its value.

Essential Questions:
• What is a decimal fraction?
• What models can be used to represent decimals?
• How are decimals and fractions related?
• How can you represent a decimal as a fraction?
• How can you compare decimals?
• How are tenths and hundredths related?
• What does a decimal point represent?
• What determines the value of a number?
• How can you determine the value of a number in relation to its place in a number?

Common Core State Standards:
4.NF.5 Express a fraction with a denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.
4.NF.6 Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.
4.NF.7 Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using the number line or another visual model.

Key Vocabulary:
decimal
decimal number
decimal fraction
tenth(s)
hundredth(s)
decimal point

Sentence Frames:
_____ hundredths/tenths is equivalent to the fraction _____ because…
_____ tenths is equivalent to _____ hundredths because…
_____ is greater than/less than ______ because…
**Suggested Materials:**
two color counters  
index cards  
money  
base ten blocks  
colored pencils or crayons

**Number Talks: Number** *Talks are used to build number sense, develop fluency, and make sense of problems.*  
Problem Solving  
Number Line Routines
### Objective 1: Students will represent fractions and equivalent decimals by using various models including models based on place value. (4.NF.5, 4.NF.6)

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Source</th>
<th>Title</th>
<th>Page Number</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>enVision 2.0</td>
<td>12-1 Fractions and Decimals</td>
<td>ENV TE p.627</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SDUSD</td>
<td>Representing Tenths</td>
<td>Unit p. 10</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>SDUSD</td>
<td>Representing Hundredths</td>
<td>Unit p. 13</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Georgia Standards</td>
<td>Decimal Designs Part 1</td>
<td>Unit p. 15</td>
<td>Suggested summarize question: What is a decimal fraction?</td>
</tr>
<tr>
<td>5</td>
<td>Georgia Standards</td>
<td>Decimal Designs Part 2</td>
<td>Unit p. 22</td>
<td>Suggested summarize question: How can you represent a decimal as a fraction?</td>
</tr>
<tr>
<td>6</td>
<td>Georgia Standards</td>
<td>Flag Fractions</td>
<td>Unit p. 25</td>
<td>Suggested summarize question: How are decimal fractions and decimal numbers alike and different?</td>
</tr>
<tr>
<td>7</td>
<td>SDUSD</td>
<td>What’s the Value?</td>
<td>Unit p. 30</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>enVision 2.0</td>
<td>12-2 Fractions on a Number Line</td>
<td>ENV TE p.633</td>
<td></td>
</tr>
</tbody>
</table>

### Objective 2: Students will compare and order decimals and decimal fractions by using various models. (4.NF.6, 4.NF.7)

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Source</th>
<th>Title</th>
<th>Page Number</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Georgia Standards</td>
<td>Decimal Line Up (Part One)</td>
<td>Unit p. 34</td>
<td>Suggested summarize question: How did you determine what numbers to place on the number lines?</td>
</tr>
<tr>
<td></td>
<td>Course</td>
<td>Activity</td>
<td>Page</td>
<td>Suggested summarize question</td>
</tr>
<tr>
<td>---</td>
<td>----------------</td>
<td>----------------------------------</td>
<td>--------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>10</td>
<td>Georgia Standards</td>
<td>Decimal Line Up (Part Two)</td>
<td>Unit p. 34</td>
<td>How did you determine what numbers to place on the number lines?</td>
</tr>
<tr>
<td>11</td>
<td>enVision 2.0</td>
<td>12-3 Compare Decimals</td>
<td>ENV TE p.639</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>SDUSD</td>
<td>Compare Decimals with Money</td>
<td>Unit p. 38</td>
<td>How did you determine which amount was greater and which was less?</td>
</tr>
<tr>
<td>13</td>
<td>Georgia Standards</td>
<td>Trash Can Basketball (Part One)</td>
<td>Unit p. 39</td>
<td>How did you compare the decimal fractions?</td>
</tr>
<tr>
<td>14</td>
<td>Georgia Standards</td>
<td>Trash Can Basketball (Part Two)</td>
<td>Unit p. 43</td>
<td>How did you compare the decimal fractions?</td>
</tr>
</tbody>
</table>

**Objective 3:** Students will express decimals fractions with denominators of 10 and 100 as equivalent amounts and will use this understanding to add decimal fractions with respective denominators 10 and 100. (NF.5, NF.6)

<table>
<thead>
<tr>
<th></th>
<th>Course</th>
<th>Activity</th>
<th>Page</th>
<th>Suggested summarize question</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>enVision 2.0</td>
<td>12-4 Add Fractions with Denominators of 10 and 100</td>
<td>ENV TE p.645</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Georgia Standards</td>
<td>Expanding Decimals with Money (Part 1)</td>
<td>Unit p. 47</td>
<td>How does a money model help you represent tenths and hundredths?</td>
</tr>
<tr>
<td>17</td>
<td>Georgia Standards</td>
<td>Expanding Decimals with Money (Part 2)</td>
<td>Unit p. 47</td>
<td>When can tenths and hundredths be used interchangeably?</td>
</tr>
<tr>
<td>18</td>
<td>enVision 2.0</td>
<td>12-6 Look For and Use Structure</td>
<td>ENV TE p. 657</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
enVision 2.0 Lesson 12-5 was not included in the suggested order of lessons due to its focus on whole number operations rather than conceptual understanding of decimals and decimal representations.
The structure of math lessons should follow the Launch, Explore, Summarize format. This structure allows students to explore mathematical concepts with rigor (fluency, concept development, and application) to develop understanding in ways that make sense. Some rich tasks may take multiple days for students to explore. In these cases, each day should still follow the Launch, Explore, Summarize format.

**LAUNCH** (5–10 minutes)
The teacher sets the stage for learning by ensuring the purpose and the rationale of the lesson are clear by connecting the purpose to prior learning, posing the problem(s), and introducing the Explore task for students. During this time the teacher is identifying the tools and materials available, reviewing academic vocabulary, and setting the expectations for the lesson.

The students are actively engaged in a short task or discussion to activate prior knowledge in preparation of the Explore task. Students may be using tools and/or manipulatives to make sense of the mathematical concept.

**EXPLORE** (15–20 minutes)
The teacher provides opportunities and support for students to develop conceptual understanding by providing meaningful explorations and tasks that promote active student engagement.

The teacher monitors the development of student understanding by conferring with students and asking students questions in order to understand and stimulate their thinking. The teacher uses this information to plan for the Summarize and, if needed, to call the students together for a mid-Explore scaffold to focus or propel student thinking.

The students are actively engaged in constructing meaning of the mathematical concept being taught. Students engage in private reasoning time before working with partners or groups. Students use multiple representations to solve rich tasks and communicate their mathematical understanding.

**SUMMARIZE** (15–20 minutes)
The teacher provides opportunities to make public the learning that was accomplished by the students by sharing evidence of what was learned, and providing opportunities for students to analyze, compare, discuss, extend, connect, consolidate, and record thinking strategies. A summary of the learning is articulated and connected to the purpose of the lesson.

The students are actively engaged as a community of learners, discussing, justifying, and challenging various solutions to the Explore task. The students are able to articulate the learning/understanding of the mathematical concept being taught either orally or in writing. Students can engage in this discussion whether or not they have completed the task.

**PRACTICE, REFLECT, and APPLY** (10–15 minutes)
This time is saved for after the Summarize so students can use what they have learned to access additional tasks. The opportunities that teachers provide are responsive to student needs.

The students may have the opportunity to: revise their work, reflect on their learning, show what they know with an exit slip, extend their learning with a similar or extension problem, or practice with centers or games.

The teacher confers with individual students or small groups.

**FORMATIVE ASSESSMENT**
The teacher determines what students are learning and are struggling with by conferring with students and by examining student work throughout the lesson. This formative assessment informs ongoing adjustments in the lesson and next steps for the class and each student.

**NUMBER TALKS**
Number Talks are a chance for students to come together to practice fluency and share their mathematical thinking by engaging in conversations and discussions around problem solving and number sense activities.
SDUSD Mathematics Units

We understand that for deep and sustainable change in mathematics to take place, teachers, students, and leaders must grapple with what the rich mathematics asked for by Common Core State Standards-Mathematics looks like in the classroom, in pedagogical practice, in student work, in curriculum, and in assessments. It is our goal that teachers and site leaders work collaboratively toward a shared vision of math instruction that develops mathematically proficient students as defined by the CCSS-Mathematics. It is our hope that these units provide a common instructional foundation for this collaboration.

The SDUSD Mathematics Units are designed to support teachers and students as we shift from a more directive style of teaching mathematics toward a more inquiry-based style. In problem-based learning, students develop the habits of mind and interaction of mathematicians through engaging in mathematical discourse, connecting representations, asking genuine questions, and justifying and generalizing ideas. These mathematical habits reflect the shifts in pedagogy required to support the Common Core Standards for Mathematical Practice.

The SDUSD math units are compiled with multiple sources to ensure students have a variety of mathematical experiences aligned to the CCSS. All lessons should follow the structure of Launch, Explore, and Summarize. The following document will guide teachers in planning for daily lessons, by helping them understand the structures of each of the sources.

Structure for enVision 2.0 Lessons

Use Step 1 Develop: Problem-Based Learning is the Launch, Explore, and Summarize for every enVision 2.0 Lesson.

Launch: (Before)

Start with the Solve-and-Share problem. Pose the problem to the students making sure the problem is understood. This does not mean you explain how to do the problem, rather you ensure that students understand what the problem is about. Establish clear expectations as to whether students will work individually, in pairs, or in small groups. This includes making sure students know which representations and tools they might be using or if they will have a choice of materials.

Explore: (During)

Students engage in solving the problem using a variety of strategies and tools. Use the suggested guiding questions to check in briefly with students as needed, in order to understand and push student thinking. You may want to use the “Extension for Early Finishers” as needed.

Summarize: (After)

Select student work for the class to analyze and discuss. If needed, use the Sample Student Work provided for each lesson in enVision 2.0.

Practice, Reflect, Apply: (Select Problems from Workbook Pages, Reteach, Games, Intervention Activity)

During this time, students may revise their work from the Explore time or you may use pieces of Step 2 Develop: Visual Learning and Step 3 Assess and Differentiate. Note: The Quick-Check component is
now a few select problems that are highlighted with a pink checkmark in the Teacher’s Edition. This time provides an excellent opportunity to pull small groups of students that may need additional support.

**Structure for Engage NY Lessons**

**Launch/Explore: (Concept Development)**

The Concept Development constitutes the major portion of instructional time when new learning is introduced. During this time, the lessons move through a deliberate progression on material, from concrete to pictorial to abstract. Your word choice may be slightly different from that in the vignettes, and you should use what works from the suggested talking points to meet your students’ needs.

**Summarize: (Student Debrief)**

The student debrief piece helps develop students’ metacognition by helping them make connections between parts of the lesson, concepts, strategies, and tools on their own. The goal is for students to see and hear multiple perspectives from their classmates and mentally construct a multifaceted image of the concepts being learned. Through questions that help make these connections explicit, and dialogue that directly engages students in the Standards for Mathematical Practice, they articulate those observations so the lesson’s objective becomes eminently clear to them.

**Practice, Reflect, Apply: (Problem Set/Exit Ticket)**

The Problem Set often includes fluency pertaining to the Concept Development, as well as conceptual and application word problems. The primary goal of the Problem Set is for students to apply the conceptual understandings learned during the lesson.

Exit Tickets are quick assessments that contain specific questions to provide a quick glimpse of the day’s major learning. The purpose of the Exit Ticket is twofold: to teach students to grow accustomed to being individually accountable for the work they have done, and to provide you with valuable evidence of the efficacy of that day’s work which is indispensible for planning purposes. This time provides an excellent opportunity to pull small groups of students that may need additional support.
Structure for Georgia Standards Lessons

The Georgia Standards tasks have been included in the units to provide students opportunities for rich, engaging, real-world mathematical experiences. These tasks allow students to develop conceptual understanding over time and may take more than one math lesson to complete. The extra time for these lessons has been allotted for in the units. When planning for a Georgia Task, it is suggested that you start by doing the mathematics the students will be engaging in before presenting it to the students.

Launch:

You may need to activate prior knowledge for some of the tasks that will be presented by showing images, letting students engage in partner talk about real-life situations, or using the suggested activity from the background knowledge component. Pose the task to the students making sure the task is understood. This does not mean that you explain how to do the problem, rather you ensure that students understand what the problem is about. You establish clear expectations as to whether students will work individually, in pairs, or in small groups. This includes making sure students know which representations and tools they might be using or if they will have a choice of materials.

Explore:

Students will engage in working on the task using a variety of strategies and tools. You may use the Essential Questions or Formative Assessment questions provided in the lesson as needed in order to understand and prompt student thinking.

Summarize:

Select student work for the class to analyze and discuss. Use partnerships and whole-class collaborative conversations to help students make sense of each others’ work. The Formative Assessment questions may also be used during this time to facilitate the conversation.

Practice, Reflect, Apply:

At this time, provide students time to reflect and revise their work from the Explore after they have engaged in the conversation in the Summarize portion of the lesson. This time provides an excellent opportunity to pull small groups of students that may need additional support.
Common Core Approach to Assessment

Assessments provide ongoing opportunities for students to show their learning accomplishments in addition to offering students a pathway to monitor their progress, celebrate successes, examine mistakes, uncover misconceptions, and engage in self-reflection and analysis. A central goal of assessments is to make students aware of their strengths and weaknesses and to give them opportunities to try again, do better and, in doing so, enjoy the experience of seeing their hard work pay off as their skill and understanding increases. Furthermore, the data collected as a result of assessments represent invaluable tools in the hands of teachers and provide specific data about student understanding that can inform instructional decisions.

For each Topic in enVision 2.0 the following assessments are available:

- In the Student Workbook:
  - Topic Assessment
  - Performance Assessment

- Online Teacher’s Edition:
  - Additional topic assessment Black-line Master
  - Additional performance assessment Black-line Master

- Online Student Assessment
  - Teacher can modify the number of items on an assessment
  - Teacher can rearrange order of problems

All of the assessment items for enVision 2.0 are aligned to the types of problems students may encounter on state testing. We have found enVision 2.0 has an excessive amount of items suggested for each topic. To avoid over-assessing, we recommend that school sites work collaboratively in grade-level teams to determine how to best use all the assessment resources available to evaluate student understanding and reduce the amount of items assessed. The SDUSD math units have grouped related topics together within a unit. Sites may choose to only give an assessment at the end of each unit, consisting of items from multiple topics, rather than using multiple days to assess each topic individually.
<table>
<thead>
<tr>
<th>LESSON FOCUS</th>
<th>Representing Tenths</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATERIALS</td>
<td>Base-Ten Blocks (flats and rods), Hundred Grid, Decimal Representation (T Sheet, Paper Bags)</td>
</tr>
</tbody>
</table>

**LAUNCH**

**Representing Tenths**
Focus students by gathering them in an open space.
1. Say, “Today we will continue thinking about how to represent decimals and what decimals mean.”
2. Show a hundred grid. Tell students this will represent the whole.
3. Ask, “What is the value of the entire grid?” “Why do you think that?” (Whole, because…..)
4. Ask, “What is the value of each column?” “Why?” (One tenth because..)
5. Say, “If I shade in 4 columns, how much of the grid would be shaded?” “Why do you think that?” (Four Tenths because…..)
6. Say, “Suppose you ran eight tenths of a mile. How might you represent eight tenths on this hundred grid?” “Why does this make sense to you?”
7. Ask, “How would you write the decimal 8 tenths?” (0.8)
8. Ask, “How would you write the decimal fraction 8 tenths?” (8/10)
9. Ask, “Did you run more or less than one mile? How do you know?”
10. Ask, “How would I represent this decimal using base ten blocks if the flat is the whole mile?” “Why?” (8 rods because…..)
11. Repeat with 4.7 miles

**EXPLORE**

**What’s In the Bag?**
Give partners some base-ten blocks (flats and 10 rods), a paper bag, and a Decimal Representation Recording Sheet.
1. Have students place the base-ten blocks in the paper bag.
2. One partner draws a handful of blocks out of the bag.
3. Partners determine the amount and record it in the base-ten model section of their recording sheet. (Partners fill in all representations)

As students work confer with them. Assess their thinking. Pose questions that will help them connect the different representations.

**SUMMARIZE**

Refocus the class by sitting in a large circle for a whole class discussion.

Select a set of decimal representations from a student sheet.
Say, “Let’s say these representations show the distance that _____ran yesterday.”
Ask students, “What can you tell about the distance _____ ran?”
Ask: “How are the representations similar? How are they different?”
Have students turn and talk to a partner. Listen in on student conversations to determine what idea(s) to bring forward to the whole group. Facilitate a discussion that connects the 3 representations to the distance ran in miles. Emphasize that all 3 representations show an equivalent amount. (the same distance)
Ask, “What does the decimal point mean?”
Have students turn and talk. Listen in on student conversations to determine what idea(s) to bring for the to the whole group. As a class establish what the decimal point means
Hundred Grid
Name: ____________________________

Decimal Representation Sheet

Real Life Situation: (Miles ran)

Decimal Number:

Decimal Fraction (may be a mixed number):

Standard Form (Using Place Value Chart)

<table>
<thead>
<tr>
<th>Hundreds</th>
<th>Tens</th>
<th>Ones</th>
<th>Tenths</th>
<th>Hundredths</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Word Form:

Base Ten Model

Grid: (Draw the whole numbers with base ten and shade the decimal on the grid)
# Fourth Grade Unit 6
## Lesson 3

<table>
<thead>
<tr>
<th>LESSON FOCUS</th>
<th>Representing Hundredths</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATERIALS</td>
<td>Ten Blocks (flats, rods, units), Hundred Grid (see master at end of lesson 2), Decimal Representation Sheet (see master at end of lesson 2), Paper Bags</td>
</tr>
</tbody>
</table>

## LAUNCH

**Representing Hundredths**
Focus students by gathering them in an open space.

1. Say, “Today we will continue thinking about how to represent decimals and what decimals mean.”
2. Show a hundred grid. Tell students this will represent the whole.
3. Ask, “What is the value of the entire grid?” “Why do you think that?” (Whole, because……)
4. Ask, “What is the value of each column?” “Why?” (One tenth because..)
5. Ask, “What is the value of each little square? Why?” (One hundredth because…..)
6. Say, “If I shade in 43 of the little squares, how much of the grid do you think would be shaded?” “Why do you think that?” (Forty-three hundredths because……)
7. Say, “Suppose you want to mail a package that weighs 2.56 pounds. How might you represent 2 and 56 hundredths pounds on this hundred grid?” “Why does that representation make sense to you?”
8. Ask, “How would I write 2 and 56 hundredths pounds using a decimal number?” (2.56 lbs.)
9. How would I write 2 and 56 hundredths pounds using a mixed number?” (2 56/100 lbs.)
10. Ask, “How would I represent this decimal using base ten blocks if the flat is the whole?” “Why does this make sense to you?” (Two flats, five rods, and six ones)
11. Repeat with
12. 4.79 lbs.

## EXPLORE

**What’s In the Bag?**
Give partners some base-ten blocks, a paper bag, and a Decimal Representation Recording Sheet.

1. Have students place the base-ten blocks in the paper bag.
2. One partner draws a handful of blocks out of the bag.
3. Partners determine the amount and record it in the base-ten model section of their recording sheet.
4. Partners fill in the other representations of the amount.

As students work confer with them. Assess their thinking. Pose questions that will help them connect the different representations.
| **SUMMARIZE** | Refocus the class by sitting in a large circle for a whole class discussion. Select a set of decimal representations from a student sheet. Say, “Let’s say these representations show the weight of a package you want to mail.” Ask students, “What can you tell about the weight of this package? How do you know?” Ask: “How are the representations similar? How are they different?” Have students turn and talk to a partner. Listen in on student conversations to determine what idea(s) to bring forward to the whole group. Facilitate a discussion that connects the 3 representations to the weight of the package. (Emphasize that all 3 representations show the same weight) Ask, “How would a model of 1.46 lbs. differ from a model for 1.64 lbs.?” Have students turn and talk. Listen in on student conversations to determine what idea(s) to bring for the to the whole group. As a class compare and contrast the two models. (1.45 lbs and 1.64 lbs) Determine which package would be heavier (weigh more) and why. |
Constructing Task: Decimal Designs

TASK CONTENT: Representing decimals and finding equivalent fractions between tenths and hundredths

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.NF.5 Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.

MCC4.NF.6 Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.

STANDARDS FOR MATHEMATICAL PRACTICE TO BE EMPHASIZED

Make sense of problems and persevere in solving them.
Reason abstractly and quantitatively.
Model with mathematics.
Use appropriate tools strategically.
Attend to precision.
Look for and make use of structure.

BACKGROUND KNOWLEDGE

While students will have previous experiences expressing fractions with denominators of 10 or 100 as fractions, this will be their first experiences with using decimal notation and investigation into decimal fractions. Students’ understanding of decimal numbers develops in grades 4-5 as follows.

4th Grade – Focus on the relationship between decimal fractions and decimal numbers and investigate the relationship between decimal fractions and decimal numbers, limit to tenths and hundredths, order decimals to hundredths, add decimal fractions with denominators of 10 and 100 (respectively)

5th Grade – Compare decimals up to thousandths, use decimals in operations

ESSENTIAL QUESTIONS

What is a decimal fraction and how can it be represented?
Comments

This lesson could be introduced by sharing shaded 10-frames and 100 grids to represent a decimal fraction or decimal. For example, share with students some of the designs below.

Discuss strategies students could use to count the number of shaded squares. Did they use multiplication? (e.g. Did they count the number of shaded squares in one part and multiply that number by the number of identical parts in the design? Did they count the number of unshaded squares and subtract from 100?) Once students have determined the decimal fraction and fraction for their favorite design ask students to share their thinking.

Finding the number of shaded squares is one way to give students an opportunity to think about pairs that make 100.

As students make their decimal designs on the 10 x 10 grid, ask them if they have more shaded or unshaded. If they have more shaded, ask them to count the number of squares that are UNSHADED and subtract that number from 100 (i.e. think about what number added to the number of unshaded squares would equal 100). This is a great opportunity to review numbers that add up to 100 and for students to explain how they know how many squares are shaded.

During the introduction or mini-lesson, students may need specific instruction on writing and reading decimal fractions and decimals. For example, the 10ths square below shows 5 out of 10 shaded boxes. As a fraction, that would be written as 5/10, and read, “five tenths.” As a decimal, it would be written as 0.5, and read, “five tenths.”

The 100 grid below shows 28 shaded squares out of 100. As a fraction, that would be 28/100, and read, “twenty-eight hundredths.” As a decimal, it would be written as 0.28 and read, twenty-eight hundredths.”
It is important for students to recognize that it doesn't matter where the fractional parts are placed. They can be scattered (above left) or they can be connected (above right).
Task Directions

PART 1

First, students will follow the directions below from the “Decimal Designs: Part 1” student recording sheet.

Create tenths and hundredths designs and label them accurately.

Next, students will follow the directions below for the “Decimal Designs, Table” student recording sheet.

Look at the example in the table below. Read the following questions and discuss how you would answer them with your partner.

What do you notice about how “1 out of 10” is written in decimal fraction form?
What do you notice about how “1 out of 10” is written in decimal form?
How are they alike? How are they different?

Complete the table below. Fill in the last three rows of the table from the “Decimals Designs” student recording sheet.

Look at the example in the table below. Read the following questions and discuss how you would answer them with your partner.

What do you notice about how “29 out of 100” is written in decimal fraction form?
What do you notice about how “29 out of 100” is written in decimal form?
How are they alike? How are they different?

Complete the table below. Fill in the last three rows of the table from the “Decimals Designs”

FORMATIVE ASSESSMENT QUESTIONS

Part 1:

● How many squares are shaded out of 10 (or 100)?
● How many squares total are in the figure?
● What decimal fraction represents the shaded part? How do you know?
● What decimal represents the shaded part? How do you know?
● How would you read the decimal fraction (or decimal) you have written?
● Which students are able to accurately write decimal fractions to describe a shaded region of a design?
● Which students are able to accurately write decimals to describe a shaded region of a design?
● Which students are able to accurately read numbers written in decimal fraction or decimal form?
Decimal Designs: Part 1

Create tenths and hundredths designs and label them accurately.

_____ shaded boxes out of 10

Decimal Fraction _______ Decimal _______

_____ shaded boxes out of 10

Decimal Fraction _______ Decimal _______

_____ shaded boxes out of 10

Decimal Fraction _______ Decimal _______

_____ shaded boxes out of 100

Decimal Fraction _______ Decimal _______

_____ shaded boxes out of 100

Decimal Fraction _______ Decimal _______
1. Look at the example in the table below. Read the following questions and discuss how you would answer them with your partner.

   What do you notice about how “1 out of 10” is written in decimal fraction form?
   What do you notice about how “1 out of 10” is written in decimal form?
   How are they alike? How are they different?

2. Complete the table below. Fill in the last three rows of the table from the “Decimals Designs: Part 1” student recording sheet.

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Decimal Fraction</strong></td>
<td><strong>Decimal</strong></td>
</tr>
<tr>
<td>1 out of 10</td>
<td>1/10</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>2 out of 10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 out of 10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 out of 10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 out of 10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>_____ out of 10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>_____ out of 10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>_____ out of 10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. Look at the example in the table below. Read the following questions and discuss how you would answer them with your partner.

What do you notice about how “29 out of 100” is written in decimal fraction form?

What do you notice about how “29 out of 100” is written in decimal form?

How are they alike? How are they different?

2. Complete the table below. Fill in the last three rows of the table from the “Decimals Designs” student recording sheet.

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Decimal Fraction</strong></td>
</tr>
<tr>
<td>29 out of 100</td>
<td>$\frac{29}{100}$</td>
</tr>
<tr>
<td>44 out of 100</td>
<td></td>
</tr>
<tr>
<td>62 out of 100</td>
<td></td>
</tr>
<tr>
<td>75 out of 100</td>
<td></td>
</tr>
<tr>
<td>100 out of 100</td>
<td></td>
</tr>
<tr>
<td>____ out of 100</td>
<td></td>
</tr>
<tr>
<td>____ out of 100</td>
<td></td>
</tr>
<tr>
<td>____ out of 100</td>
<td></td>
</tr>
</tbody>
</table>
PART 2

First, students will follow the directions below from the “Decimal Designs: Part 2” student recording sheet.

Create tenths and hundredths designs and label them accurately.

Next, students will follow the directions below for the “Decimal Designs: Part 2, Table” student recording sheet.
1. Look at the example in the table below. Read the following questions and discuss how you would answer them with your partner.
   - What do you notice about how “2 out of 10” is written in decimal form using tenths?
   - What do you notice about how “20 out of 100” is written in decimal form using hundredths?
2. How are they alike? How are they different?
3. Complete the table below. Fill in the last four rows of the table from the “Decimals Designs: Part 2” student recording sheet.

FORMATIVE ASSESSMENT QUESTIONS

Part 2:
- How many squares are shaded out of 10 (or 100)?
- How many squares total are in the figure?
- What decimal fraction represents the shaded part? How do you know?
- What decimal represents the shaded part? How do you know?
- How would you read the decimal fraction (or decimal) you have written?
- How are the models of tenths related to the models of hundredths?
- What do the models of the tenths and hundredths have in common? What is different?
- How can a decimal written in tenths be written as a decimal expressed in hundredths?
- Which students are able to accurately write decimal fractions to describe a shaded region of a design?
- Which students are able to accurately write decimals to describe a shaded region of a design?
- Which students are able to accurately read numbers written in decimal fraction or decimal form?
- Which students were able to connect the representations of tenths to the equivalent representation of hundredths?
4. How are they alike? How are they different?
5. Complete the table below. Fill in the last four rows of the table from the “Decimals Designs: Part 2” student recording sheet.
Decimal Designs: Part 2
Create tenths and hundredths designs that represent the same amount and label them accurately.
Decimal Designs: Part 2

1. Look at the example in the table below. Read the following questions and discuss how you would answer them with your partner.
   - What do you notice about how “2 out of 10” is written in decimal form using tenths?
   - What do you notice about how “20 out of 100” is written in decimal form using hundredths?
   - How are they alike? How are they different?

2. Complete the table below. Fill in the last four rows of the table from the “Decimals Designs: Part 2” student recording sheet.

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 out of 10</td>
<td>2/10, 0.2</td>
</tr>
<tr>
<td>20 out of 100</td>
<td>20/100, 0.20</td>
</tr>
<tr>
<td>8 out of 10</td>
<td></td>
</tr>
<tr>
<td>80 out of 100</td>
<td></td>
</tr>
<tr>
<td>out of 10</td>
<td></td>
</tr>
<tr>
<td>out of 100</td>
<td></td>
</tr>
</tbody>
</table>
Performance Task: Flag Fractions

**TASK CONTENT:** Representing decimals using decimal squares and decimal notation

**STANDARDS FOR MATHEMATICAL CONTENT**

**MCC4.NF.5** Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100\(^1\).

**MCC4.NF.6** Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.

**STANDARDS FOR MATHEMATICAL PRACTICE TO BE EMPHASIZED**

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make sure of structure.

**BACKGROUND KNOWLEDGE**

This task is expected to follow “Decimal Designs,” therefore students should be familiar with describing a shaded region of a whole as a decimal fraction and as a decimal number.

<table>
<thead>
<tr>
<th>This color represents what part of the flag?</th>
<th>Written as a Decimal Fraction</th>
<th>Written as a Decimal Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>(\frac{25}{100})</td>
<td>0.25</td>
</tr>
<tr>
<td>Yellow</td>
<td>(\frac{44}{100})</td>
<td>0.44</td>
</tr>
<tr>
<td>Green</td>
<td>(\frac{31}{100})</td>
<td>0.31</td>
</tr>
</tbody>
</table>

Students may need some assistance estimating the shaded region of a color. In the example above, the blue region was found by counting two columns of 10 and then half of a column of 10, or 5 more. Therefore \(\frac{25}{100}\) of 0.25 can be used to represent the blue shaded region. The yellow region was found by four columns of 10 and two columns of half of 10 for a total of 50 blocks, but blocks that the three green squares cover is approximately two blocks per green square for a total of 6 blocks. This needs to be subtracted from the 50 blocks leaving 44 yellow blocks. The yellow region can be represented by \(\frac{44}{100}\) or 0.44 of the flag. Finally the green region is the same as the yellow region, but the 6 green blocks needs to be added for the three green squares in the middle.
ESSENTIAL QUESTIONS

- What is a decimal fraction and how can it be represented?
- When is it appropriate to use decimal fractions?
- How are decimal numbers and decimal fractions related?

MATERIALS

- “Flag Fractions, Flags From Around the World” student recording sheet
- “Flag Fractions, Create-a-Flag” student recording sheet
- crayons, colored pencils, or markers
- examples of flags (optional)

GROUPING

Individual/Partner Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

In this task, students will work to determine the decimal fraction and decimal number represented by each color of a flag. Then students will create their own flag and identify the decimal fraction and decimal number represented by each color of a flag.

COMMENTS

This task can be introduced by asking students to write the decimal fraction and decimal number that represents the shaded area of one or more of the decimal patterns students created during the “Decimal Patterns” task.

Allow students to complete the first student sheet, “Flag Fractions, Flags From Around the World” and discuss the results before asking students to create their own flag designs. Students may need assistance estimating the number of blocks to count for each color. See the example in the “Background Knowledge” section below. Students should be encouraged to share their work by presenting or posting the flags they created.
Task Directions
Students will follow the directions below from the “Flag Fractions, Flags From Around the World” student recording sheet.

Choose one of the flags below. Sketch the flag on the 10 x 10 grid below. When finished, determine the number of sections for each color. Record your answer as a fraction and a decimal. If one color does not completely fill a box, choose the color that fills the most of the box.

Then students will follow the directions below from the “Flag Fractions, Create-a-Flag” student recording sheet.

You have the unique opportunity to create your own flag.
1. Decide a name for the country your flag will represent.
2. On the grid paper below, create a flag for the country using as many colors as desired.
3. Complete the chart below.
If one color does not completely fill a box, choose the color that fills the most of the box.

FORMATIVE ASSESSMENT QUESTIONS

● How many blocks make up the flag? (100) How many blocks are shaded this color?
● How would you write that as a decimal fraction? How do you know?
● How would you write that as a decimal number? How do you know?
● How do you read this decimal fraction? Decimal number? How do you know?
● How are these numbers (decimal fraction, decimal number) alike? Different?
● How could you estimate the number of blocks that are filled with this color?
● Which students are able to recognize and represent colored regions of the flag using decimal fractions and decimal numbers?
● Which students are able to describe how decimal fractions and decimal numbers are alike and different? (Alike because they both represent the same sized region and they are both read the same. Different because they are written in two different forms.)
● Asks students to compare two flags and their graphs. What similarities/differences can be found?
Choose one of the flags below. Sketch the flag on the 10 x 10 grid below. When finished, determine the number of sections for each color. Record your answer as a fraction and a decimal. If one color does not completely fill a box, choose the color that fills the most of the box. (You do not need to sketch a crest, i.e. Paraguay, Portugal, Rwanda, San Marino etc.)

This color represents what part of the flag? | Written as a Decimal Fraction | Written as a Decimal Number
---|---|---

<table>
<thead>
<tr>
<th>Norway</th>
<th>Onan</th>
<th>Pakistan</th>
<th>Palau</th>
<th>Philippines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Papua New Guinea</td>
<td>Paraguay</td>
<td>Peru</td>
<td>Philippines</td>
<td>Poland</td>
</tr>
<tr>
<td>Portugal</td>
<td>Qatar</td>
<td>Romania</td>
<td>Russia</td>
<td>Rwanda</td>
</tr>
<tr>
<td>St. Kitts &amp; Nevis</td>
<td>St. Lucia</td>
<td>St. Vincent &amp; The Grenadines</td>
<td>Samoa</td>
<td>San Marino</td>
</tr>
</tbody>
</table>
Flag Fractions
Create-a-Flag

You have the unique opportunity to create your own flag.
1. Decide a name for the country your flag will represent.
2. On the grid paper below, create a flag for the country using as many colors as desired.
3. Complete the chart below.
   If one color does not completely fill a box, choose the color that fills the most of the box.

Name of your country ______________________

Flag for your country:

Fill in the information below for each color used in your flag. If you use more than 4 colors, continue on the back of this paper.

<table>
<thead>
<tr>
<th>This color represents what part of the flag?</th>
<th>Written as a Decimal Fraction</th>
<th>Written as a Decimal Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Fourth Grade Unit 6
Lesson 7

LESSON FOCUS  | Decimal Equivalencies
MATERIALS    | Multi-Hundred grid, game cards, colored pencils

LAUNCH  | What's the Value?
Focus students by gathering them in an open space. Have a Multi-Hundred Grid paper displayed so all students can see it. (Use Doc cam or promethean board)
1. Write the following on the board.
   - 1 whole
   - 14 tenths
   - 37 hundredths
2. Ask, “How can I show the one whole on this grid paper?” (Lightly shade in and outline one hundred grid in yellow) Establish that you will use yellow to show wholes.
3. Ask, “How can I show 14 tenths?” (Lightly shade in 14 tenths in red). Establish that you will use red to shade in tenths.
4. Ask, “Can you identify another whole?” (Draw a yellow outline around the second whole that is now shaded)
5. Ask, “How can I show 37 hundredths?” (Lightly shade in 37 hundredths in green) Establish that you will use green to shade in hundredths.
6. Ask, “Can you identify another whole?” “How do you know?”
7. Ask, “Can you identify another tenth(s)?” “How do you know?” (Draw a red outline around the additional 3 tenths)
8. Ask, “What is the value of the entire outlined area?” “How do you know?”
Have students turn and talk about their interpretation of the value of the entire area. (2.77). Listen in and strategically pick a student or two to share their interpretation(s) and facilitate a discussion as a class.
9. Establish that 1 whole, 14 tens and 37 hundredths has the same value or is equivalent to 2 wholes and 7 tenths and 7 hundredths. It is also equivalent to 2 wholes and 77 hundredths. These are 3 different ways to represent the same value.

EXPLORE  | What’s the Value?
Give partners a Multi-Hundred Grid, red, yellow and green colored pencils or crayons and a set of game cards.
1. Have students turn cards upside down and draw one.
2. Partners represent the values on the multi-hundred grid (Wholes in yellow, tenths in red and hundredths in green) and find the total value by outlining wholes in yellow and tenths in red.
3. Repeat.
As students work confer with them. Assess their thinking. Pose questions that will help them locate the wholes, tenths and hundredths in their representations. Focus on the idea that they are showing the same value in different ways.

SUMMARIZE  | Refocus the class by sitting in a large circle for a whole class discussion.
Pick one example of a representation for one of the game cards that everyone worked on and represented. Display it so all students can consider it.
Ask: What is the value of this representation and how do you know?
Give students private time to reason. Have them talk to a partner. Listen in on conversations in order to strategically pick which student idea(s) to bring forward to the class.
Facilitate a conversation focusing on the equivalence of 10 tenths, 100 hundredths and 1 whole, as well as the equivalence of 10 hundredths and 1 tenth.

Ask, Now would a model/representation for 2.50 differ from a model for 2.5?
Give students private time to reason. Have them talk to a partner about what they are thinking and why. Listen in on partner conversations in order to strategically pick an idea to bring forth to the class for discussion.
Facilitate a discussion about how the two representations/models are the same and how they are different.
<table>
<thead>
<tr>
<th>1 whole 15 tenths 61 hundredths</th>
<th>2 wholes 19 tenths 22 hundredths</th>
<th>1 whole 13 tenths 18 hundredths</th>
<th>1 whole 12 tenths 48 hundredths</th>
<th>1 whole 11 tenths 33 hundredths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 whole 14 tenths 24 hundredths</td>
<td>1 whole 15 tenths 90 hundredths</td>
<td>2 wholes 19 tenths 20 hundredths</td>
<td>1 whole 17 tenths 55 hundredths</td>
<td>1 whole 18 tenths 71 hundredths</td>
</tr>
<tr>
<td>1 whole 12 tenths 64 hundredths</td>
<td>1 whole 13 tenths 21 hundredths</td>
<td>1 whole 16 tenths 66 hundredths</td>
<td>2 wholes 19 tenths 45 hundredths</td>
<td>1 whole 14 tenths 91 hundredths</td>
</tr>
<tr>
<td>1 whole 11 tenths 84 hundredths</td>
<td>1 whole 14 tenths 76 hundredths</td>
<td>1 whole 19 tenths 11 hundredths</td>
<td>1 whole 17 tenths 23 hundredths</td>
<td>2 wholes 16 tenths 38 hundredths</td>
</tr>
<tr>
<td>1 whole 12 tenths 49 hundredths</td>
<td>1 whole 13 tenths 53 hundredths</td>
<td>2 wholes 16 tenths 67 hundredths</td>
<td>1 whole 11 tenths 75 hundredths</td>
<td>1 whole 18 tenths 88 hundredths</td>
</tr>
<tr>
<td>1 whole 14 tenths 69 hundredths</td>
<td>1 whole 15 tenths 28 hundredths</td>
<td>1 whole 12 tenths 46 hundredths</td>
<td>2 wholes 11 tenths 25 hundredths</td>
<td>1 whole 13 tenths 81 hundredths</td>
</tr>
<tr>
<td>1 whole 17 tenths 82 hundredths</td>
<td>1 whole 14 tenths 56 hundredths</td>
<td>1 whole 15 tenths 18 hundredths</td>
<td>1 whole 12 tenths 93 hundredths</td>
<td>2 wholes 11 tenths 58 hundredths</td>
</tr>
<tr>
<td>1 whole 15 tenths 59 hundredths</td>
<td>1 whole 18 tenths 93 hundredths</td>
<td>2 wholes 15 tenths 62 hundredths</td>
<td>1 whole 16 tenths 74 hundredths</td>
<td>1 whole 18 tenths 58 hundredths</td>
</tr>
</tbody>
</table>
**Practice Task:** Decimal Line-up

**TASK CONTENT:** Order decimal numbers, place decimal numbers on a number line

**STANDARDS FOR MATHEMATICAL CONTENT**

**MCC4.NF.5** Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.

**MCC4.NF.6** Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.

**MCC4.NF.7** Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of the comparisons with the symbols >, <, or =, and justify the conclusions, e.g. by using a visual model.

**STANDARDS FOR MATHEMATICAL PRACTICE TO BE EMPHASIZED**

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make sense of structure.

**BACKGROUND KNOWLEDGE**

Students need to be very familiar with number lines and counting using decimal numbers. One way to give students practice in counting using decimal numbers is to provide students with adding machine tape on which they can list decimal numbers. Give them a starting number and ask them to list the numbers to the hundredths place (or to the tenths place). Students can be given an ending number or they may be asked to fill a strip of adding machine tape. See the two examples shown.

**ESSENTIAL QUESTIONS**

- What models can be used to represent decimals?
- What are the benefits and drawbacks of each of these models
MATERIALS

- "Decimal Line-up" student recording sheet (2 pages)

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Students will order and then place decimal numbers (tenths and hundredths) on a number line.

Part One:

Comments

To introduce this task, discuss as a large group the structure of a number line that includes decimals. Students need to recognize that like a ruler, tick marks of different lengths and weights represent different types of numbers.

One way to begin this task is to display the number line shown below:

As a class, discuss where the following decimal numbers would be located on the number line: 6.5, 6.25, 6.36, 6.72, and 6.9. Start by discussing which benchmark whole numbers would be required for the set of numbers to be placed on the number line. Students should recognize that the smallest number is greater than 6, so the number line would need to start at 6. The largest number is less than 7, so the number line would need to go to 7.

Once the benchmark numbers have been labeled, ask students how to place the following decimal numbers: 6.5 and 6.9. Students should be able to place these decimal numbers on the number line as shown below.

Once the tenths have been labeled work as a class to place the decimal numbers 6.25, 6.36, and 6.72. While placing these decimal numbers on the number line use the “think aloud” strategy to explain how you know it is being placed in the correct location on the number line. Alternatively, ask students to explain where to correctly place these decimal numbers on the number line. Once all of the given decimal numbers are placed, the number line should be similar to the one shown below.
Before students begin to work on this task, help students label the landmark numbers on the number lines of the “Decimal Line-up” student sheet.

Ask students to consider the benchmark numbers that they will need to place on the number line. For example, the first problem asks students to place the following decimal numbers on the number line: 3.7, 2.3, 1.6, 0.9, and 1.2. Ask students what whole numbers these decimal numbers fall between. Students should recognize that the smallest number is less than 1, so the number line would need to start at zero. The largest number is greater than 3, so the number line would need to go to at least 4. As a large group, have the students label the number line on their student recording sheets correctly (see below).

![Number Line](image)

**TASK:** Decimal Line Up #1. Ordering Tenths (see attached)

**Task Directions**

*Students will follow directions on the “Decimal Line-up” student*

To complete this task, students will need to correctly label one number line with decimal numbers to the tenths.

**FORMATIVE ASSESSMENT QUESTIONS**

- What are the whole number benchmark numbers for your decimals? How do you know?
- What are the benchmark numbers to the tenths place? How do you know?
- What is the largest/smallest decimal number? How will you use that information?
- Which tick marks will be used to represent decimal numbers to the tenths? Hundredths?
- Which students are able to identify benchmark numbers for the decimal numbers they need to place on a number line?
- Which students are able to place decimal numbers to the tenths on a number line?
- Which students are able to place decimal numbers to the hundredths on a number line?
Decimal Line-up

1. **Ordering tenths.**
   a. **Order the following decimals from least to greatest.**

   \[
   3.7 \quad 2.3 \quad 1.6 \quad 0.9 \quad 1.2
   \]

   \[
   \underline{\quad \quad \quad \quad \quad \quad \quad \quad \quad}
   \]

   b. **Next, place the decimal numbers on the number line below. Add whole numbers as needed to the number line.**

   ![Number Line Diagram]

   c. **Write to explain how you know the decimal numbers are placed correctly.**

   ______________________________________

   ______________________________________

   ______________________________________

   ______________________________________

   ______________________________________

   ______________________________________
## Fourth Grade Unit 6
### Lesson 12

<table>
<thead>
<tr>
<th>LESSON FOCUS</th>
<th>Comparing Decimals and Decimal Fractions</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATERIALS</td>
<td>Bag with various coins, paper</td>
</tr>
<tr>
<td>LAUNCH</td>
<td><strong>Compare Decimals with Money</strong></td>
</tr>
<tr>
<td></td>
<td>Focus students by gathering them in an open space. Have a bag with various coins inside.</td>
</tr>
<tr>
<td></td>
<td>1. Select one student to come up and grab a few coins.</td>
</tr>
<tr>
<td></td>
<td>2. Have the class help you figure out the value of the coins.</td>
</tr>
<tr>
<td></td>
<td>3. Write the value of the coins as decimal as well as a fraction.</td>
</tr>
<tr>
<td></td>
<td>4. Have another student grab a few coins.</td>
</tr>
<tr>
<td></td>
<td>5. Have the class figure out the value of the coins.</td>
</tr>
<tr>
<td></td>
<td>6. Write the value of the coins as a decimal as well as a fraction.</td>
</tr>
<tr>
<td></td>
<td>7. Ask, &quot;Which amount/value is greater?&quot;</td>
</tr>
<tr>
<td></td>
<td>8. Ask, &quot;What comparison equation can we write to compare the two amounts?&quot;</td>
</tr>
<tr>
<td></td>
<td>9. Write the comparison equation using, &lt;, &gt;, or =.</td>
</tr>
</tbody>
</table>

| EXPLORE      | **Compare Decimals with Money**          |
|              | Give partners a bag with various coins and paper. |
|              | 1. One partner grabs a few coins and writes the value of the coins as a fraction and a decimal. |
|              | 2. Second partner grabs a few coins and writes the value of the coins as a fraction and a decimal. |
|              | 3. Partners work together to write a comparison equation to compare the two amounts using <, >, =. |
|              | 4. Partners repeat as time allows. |

| SUMMARIZE    | Refocus the class by sitting in a large circle for a whole class discussion. |
|              | Select a student to display one of their comparisons for a whole class discussion. |
|              | Ask students, “What coins could you use to make this value?” |
|              | Is there another combination of coins we could use to make this value?” |
|              | How do these coins match our fraction representation? How do these coins match our decimal representation? |
|              | Ask: How did you determine which amount had a greater value and which amount had a lesser value? |
|              | Give students time to reason privately. Have them talk to a partner about their ideas. Listen in on conversations to determine which ideas you want to bring forth to the class for discussion. |
|              | Facilitate a whole group discussion around determining which value is greater or less. |
Practice Task: Trash Can Basketball

**TASK CONTENT:** Representing decimals and comparing decimals

**STANDARDS FOR MATHEMATICAL CONTENT**

**MCC4.NF.7** Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of the comparisons with the symbols >, =, or <, and justify the conclusions, e.g. by using a visual model.

**STANDARDS FOR MATHEMATICAL PRACTICE TO BE EMPHASIZED**

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.

**BACKGROUND KNOWLEDGE**

Before the activity, the class should have had several lessons to demonstrate and practice understanding and representing tenths.

One tenth of a final score is determined by one throw if your final score (the whole) is determined by ten throws.

**ESSENTIAL QUESTIONS**

- How are decimals and fractions related?
- Why is the number 10 important in our number system?
- How can I write a decimal to represent a part of a group?
- When we compare two decimals, how do we know which has a greater value?

**MATERIALS**

- “Trash Can Basketball” student recording sheet
- Each group will need 10 pieces of “trash” (paper balls).
- Box, tub, or trash can for a container
- Crayons or markers and construction paper for making a post
TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Students collect data from playing “Trash Can Basketball.” They use the data to write decimal fractions and decimal numbers.

Comments
The copy room is a good source of trash paper. Be sure the paper balls are tight. Loosely packed ones make it really difficult to throw accurately.

All solutions reached in this task should be specific to the data collected. All student work should show both their data and their partner’s data. Tallies should match decimal numbers assigned. Explanations should be clearly stated and specific.

Before beginning the throwing contest, as a class, decide on any rules regarding practice throws.

Task Directions PART 1
Students will follow directions below from the “Trash Can Basketball: Part 1” student recording sheet. This is your chance to demonstrate your basketball skills! You have been chosen to participate in a paper-ball throwing contest.

Directions:
1. Use the scrap paper to make 10 paper balls per group. (Wad the paper balls up tightly so they are easier to aim.)
2. Place a trash can (or other large container) 5 feet away.
3. Predict how many paper balls you will be able to get into the basket. Write your prediction in the chart below.
4. Take turns with your partner(s) throwing the ten paper balls into the trash can. Your partner will collect data using tally marks on the chart below to show how many of the 10 paper balls went into the trash can.
5. Create a poster to display your group’s results. Your poster should include the following.
   a. Represent the number of good throws for each partner as a decimal fraction and express a comparison of decimal fraction scores using a >, <, or = symbol.
   b. Represent the number of good throws for each partner as decimal numbers and express a comparison of decimal scores using a >, <, or = symbol.
   c. Write to explain the results of the contest. Be prepared to share your poster and results with the class.
FORMATIVE ASSESSMENT QUESTIONS

- How did you determine your score? How many times did you throw the paper ball?
- How many times did you “make a basket”?
- How is your score written as a decimal fraction?
- How is your score written as a decimal?
- How do we compare two decimal fractions?
- How do we compare two decimals?
- How did you collect your data for Part 2?
- Why did the denominator of the fractions change for part 2?
- How are the decimals from Part 1 like the decimals from Part 2? How are they different?
- Do students recognize how decimal fractions and decimals are related?
- Can students correctly compare the two scores in both decimal fraction and decimal forms?
- Could students explain why the denominators changed from Part 1 to Part 2?
This is your chance to demonstrate your basketball skills! You have been chosen to participate in a paper-ball throwing contest.

Directions:
1. Use the scrap paper to make 10 paper balls per group. (Wad the paper balls up tightly so they are easier to aim.)

2. Place a trash can (or other large container) 5 feet away.

3. Predict how many paper balls you will be able to get into the basket. Write your prediction in the chart below.

4. Take turns with your partner(s) throwing the ten paper balls into the trash can. Your partner will collect data using tally marks on the chart below to show how many of the 10 paper balls went into the trash can.

<table>
<thead>
<tr>
<th>Trash Can Basketball Contest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Player #1</td>
</tr>
<tr>
<td>Number of Tosses</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>Player #2</td>
</tr>
<tr>
<td>Number of Tosses</td>
</tr>
<tr>
<td>10</td>
</tr>
</tbody>
</table>

5. Create a poster to display your group’s results. Your poster should include the following.

a. Represent the number of good throws for each partner as a decimal fraction and express a comparison of decimal fraction scores using a >, <, or = symbol.

b. Represent the number of good throws for each partner as decimal numbers and express a comparison of decimal scores using a >, <, or = symbol.

c. Write to explain the results of the contest. Be prepared to share your poster and results with the class.
Practice Task: Trash Can Basketball

**TASK CONTENT:** Representing decimals and comparing decimals

**STANDARDS FOR MATHEMATICAL CONTENT**

*MCC4.NF.7* Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of the comparisons with the symbols >, =, or <, and justify the conclusions, e.g. by using a visual model.

**STANDARDS FOR MATHEMATICAL PRACTICE TO BE EMPHASIZED**

3. Make sense of problems and persevere in solving them.
4. Reason abstractly and quantitatively.
8. Model with mathematics.
9. Use appropriate tools strategically.
10. Attend to precision.
11. Look for and make use of structure.

**BACKGROUND KNOWLEDGE**

Before the activity, the class should have had several lessons to demonstrate and practice understanding and representing tenths.

One tenths of a final score is determined by one throw if your final score (the whole) is determined by ten throws.

**ESSENTIAL QUESTIONS**

- How are decimals and fractions related?
- Why is the number 10 important in our number system?
- How can I write a decimal to represent a part of a group?
- When we compare two decimals, how do we know which has a greater value?

**MATERIALS**

- “Trash Can Basketball” student recording sheet
- Each group will need 10 pieces of “trash” (paper balls).
- Box, tub, or trash can for a container
- Crayons or markers and construction paper for making a poster
PART 2
Students will follow directions below from the “Trash Can Basketball: Part 2” student recording sheet.
This is your chance to demonstrate your basketball skills! You have been chosen to participate in a paper-ball throwing contest.

Directions:
1. Use the scrap paper to make 10 paper balls per group. (Wad the paper balls up tightly so they are easier to aim.)
2. Place a trash can (or other large container) 5 feet away.
3. Predict how many paper balls you will be able to get into the basket. Write your prediction in the chart below.
4. Take turns with your partner(s) throwing the ten paper balls into the trash can. Your partner will collect data using tally marks on the chart below to show how many of the 10 paper balls went into the trash can.
5. Combine your data with the data of 9 other people and record it below, for a total of 100 throws.
6. Create a poster to display your group’s results. Your poster should include the following.
   a. Represent the number of good throws for each partner as a decimal fraction and decimal out of 100 throws for the entire group.
   b. Represent the total number of good throws for the entire group as a decimal fraction and decimal out of 100 throws for the entire group.
      Example:
      | Player | 5/100 | 0.05 of the baskets |
      |--------|-------|--------------------|
      | #1     | 5/100 | 0.05 of the baskets |
      | #2     | 7/100 | 0.07 of the baskets |
      | TOTAL  | 67/100| 0.67 of the baskets |
   c. Write to explain the results of the contest. Be prepared to share your poster and results with the class.
   d. Compare your group data with the data of other people in your class.
FORMATIVE ASSESSMENT QUESTIONS

- How did you determine your score? How many times did you throw the paper ball?
- How many times did you “make a basket”?
- How is your score written as a decimal fraction?
- How is your score written as a decimal?
- How do we compare two decimal fractions?
- How do we compare two decimals?
- How did you collect your data for Part 2?
- Why did the denominator of the fractions change for part 2?
- How are the decimals from Part 1 like the decimals from Part 2? How are they different?
- Do students recognize how decimal fractions and decimals are related?
- Can students correctly compare the two scores in both decimal fraction and decimal forms?
- Could students explain why the denominators changed from Part 1 to Part 2?
Trash Can Basketball: Part 2

Now that you’ve compared your and your partner’s data, let’s see how we can represent the results of more people!

Directions:
1. Combine your data with the data of 9 other people and record it below, for a total of 100 throws.

<table>
<thead>
<tr>
<th>Player</th>
<th>Number of “Baskets”</th>
<th>Score as a fraction (out of 100)</th>
<th>Score as a decimal (out of 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2.</td>
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<td>3.</td>
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<td>4.</td>
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<td>5.</td>
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<td>6.</td>
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<td>8.</td>
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<td>9.</td>
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<td>10.</td>
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<tr>
<td>TOTAL</td>
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</tr>
</tbody>
</table>

2. Create a poster to display your results. Your poster should include the following.
   a. Represent the number of good throws for each partner as a decimal fraction and decimal out of 100 throws for the entire group.
   b. Represent the total number of good throws for the entire group as a decimal fraction and decimal out of 100 throws for the entire group.
   c. Write to explain the results of the contest. Be prepared to share your poster and results with the class.
Scaffolding Task: Expanding Decimals with Money

TASK CONTENT: Building decimal fractions and decimals in expanded notation

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.NF.7 Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of the comparisons with the symbols >, +, or <, and justify the conclusions, e.g. by using a visual model.

STANDARDS FOR MATHEMATICAL PRACTICE TO BE EMPHASIZED

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Using our money system, where the dime represents tenths and the penny represents hundredths, students may more easily see decimals as parts of a whole, with the whole being one dollar. Decimal fractions such as 45/100 can be easily modeled using dimes and pennies as 4 dimes and 5 pennies. This allows the students to easily see 45/100 as 40/100 + 5/100 as well as 4/10 + 5/100.
ESSENTIAL QUESTIONS

- When can tenths and hundredths be used interchangeably?
- When you compare two decimals, how can you determine which one has the greater value?

MATERIALS

- 10 dimes and 10 pennies for each pair
- “Expanding Decimals with Money” Recording Sheet

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Comments

As students develop their decimal understanding, we need to continually emphasize the link between fraction concepts and our base-ten place value system. Revisiting the link between decimal fractions and decimals often and working with familiar contexts for decimal fractions will help build that bridge. Additionally, continuing to help students see decimals as a continuation of our base-ten whole number system will help them apply the rules of whole numbers within fraction situations. This lesson helps students see decimals and decimal fractions in expanded form, much like they have done expanded form using whole numbers. This ability to expand tenths and hundredths will help in later tasks as students add tenths and hundredths.

Students need to develop the ability to think flexibly about decimals in a variety of contexts. One of the contexts of decimals they are most familiar with is that of our money system.

TASK: (Note: On Day 1 students work on representing the value of about 4 handfuls of money that they pull from the bag. On day 2 students work on representing the value of 5 additional handfuls of money that they pull from the bag. Students will use the same recording sheet “Expanding Decimals with Money” on both days.

Review with students that pennies represent hundredths of a dollar and dimes represent tenths of a dollar. Have students compare this model of decimals with base-ten models they have used previously.
Which pieces of the base ten model match with the dimes? With the pennies? With the dollar?

Review expanded form notations using whole numbers. Model who to write a decimal fraction in expanded form based on students’ previous knowledge.

\[ \frac{45}{100} = \frac{40}{100} + \frac{5}{100} = \frac{4}{10} + \frac{5}{100} \]

Student Directions:

Pull a handful of coins from your bag of dimes and pennies. Fill in the table below with the decimal represented by your coins. Write your decimals in expanded notation using both the dime and penny combination and how you would represent it if you only used pennies. See the example in the table.

<table>
<thead>
<tr>
<th>Decimal</th>
<th>Decimal Made with Pennies (with Expanded Notation)</th>
<th>Decimal Made with Pennies and Dimes (with Expanded Notation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.36</td>
<td>30 pennies + 6 pennies 30/100 + 6/100</td>
<td>3 dimes + 6 pennies 3/10 + 6/100</td>
</tr>
</tbody>
</table>

**FORMATIVE QUESTIONS**

- How do the dimes represent decimal fractions? The pennies?
- How does a money model help you represent tenths and hundredths?
- What strategies did you use to add tenths and hundredths?
- Were students able to move easily from tenths to hundredths?
- Did students see the connection between the money models and the base ten model previously used?
- How did I assess for student understanding?

**SUGGESTED SUMMARIZE QUESTION FOR DAY 1** (focus on the money representation):

- How does a money model help you represent tenths and hundredths?

**SUGGESTED SUMMARIZE QUESTION FOR DAY 2** (focus on the relationship between tenths and hundredths)

- When can tenths and hundredths be used interchangeably?
Expanding Decimals with Money

Pull a handful of coins from your bag of dimes and pennies. Fill in the table below with the decimal represented by your coins. Write your decimals in expanded notation using both the dime and penny combination and how you would represent it if you only used pennies. See the example in the table.

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<td>0.36</td>
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<td>3 dimes + 6 pennies [3/10 + 6/100]</td>
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